

RESEARCH DEPARTMENT

THE SERVICE AREA OF THE HOLME MOSS TRANSMITTER

Report No. K-095

(1954/2)

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January, 1954

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THE SERVICE AREA OF THE HOLME MOSS TRANSMITTER

1. GENERAL

This report gives the results of a survey of the service area of the Holme Moss television transmitter. The results show that the service area is somewhat larger than that predicted in the site test report. (Research Report No. T-011/3). It is shown that in all but exceptional circumstances multipath interference troubles can be overcome by using a directional receiving aerial.

2. INTRODUCTION

Shortly after the opening of the Holme Moss transmitter (October 1951), field strength measurements were made at representative points in the principal towns, viz. Liverpool, Manchester, Leeds and Sheffield. The results of these tests were in good agreement with those predicted from the site test measurements.

A complete survey of the service area was delayed until the summer of 1952; in particular it became necessary urgently to investigate complaints of serious multipath interference in the Sheffield area. Reference is made to the conclusions drawn from this investigation in the text of this report.

In the course of the survey, some observations of multipath effects were also carried out in some of the larger urban areas with a television receiver.

3. RESULTS

All the survey measurements were carried out on signals from the vision transmitter, radiating normal programme. The field strengths quoted in this report have, however, been corrected to correspond to peak white power, an E.R.P. of 90 kW.

Occasional comparative measurements of the vision and sound signals showed that, in general, the ratio of the field strength of vision (peak white) and sound signals was 2:1, the correct ratio. All field strength measurements quoted in this report refer to the field strength 30 feet above ground level.

A contour map of the service area is shown in Fig. 1. The maximum, mean and minimum field strengths for towns in the survey area are given in alphabetical order in Table I. Contour maps showing details of the field strength in the Manchester, Liverpool and Birkenhead, Leeds and Sheffield areas are given in Figs. 2, 3, 4 and 5 respectively. Since these detailed contour maps are to a larger scale and measured in more detail than the overall service area map their accuracy will be somewhat

greater than ± 10 dB, the limit of accuracy for service area maps. The field strengths in various districts of Manchester, Liverpool, Leeds, Sheffield and Birkenhead are given in Tables II, III, IV, V and VI respectively. Site data is given in Appendix I.

4. DISCUSSION OF RESULTS

The service area indicated by the contours of Fig. 1 is somewhat larger than that predicted from the site test measurements. This is to some slight extent accounted for by the fact that the site test map was drawn for an E.R.P. of 70 kW, whereas the E.R.P. is now 90 kW. The discrepancy is greatest in the area beyond the 1 mV/m contour, because most of the site test effort was necessarily directed towards establishing the probable field strength in the very highly populated inner areas which are subject to severe screening by surrounding hills.

From the detailed contour maps it will be seen that Manchester, (Fig. 2) has an adequate field strength in all parts of the city, and, the terrain being relatively flat, it does not suffer from any multipath interference.

In Leeds (Fig. 4), the mean field strength is 14 mV/m, but due to the city's hilly topography the field strength contours cover the range 2.0 mV/m to 50 mV/m and, in fact, a field strength of 0.8 mV/m was recorded at one point in the city. Multipath interference is not serious in Leeds and it has been found that in the small area where it is evident it is readily overcome by using a simple directional aerial.

The mean field strength in Liverpool is 2.5 mV/m and the contour map (Fig. 3) shows that in the highly industrial area by the Mersey the field strength is less than 0.5 mV/m, yet, while there have been complaints of multipath interference in and near the dock area, there have been no complaints from other areas of the city where the field strength lies between 1 mV/m and 2 mV/m.

From the contour map of Sheffield (Fig. 5), it will be seen that certain low-lying areas receive field strengths of less than 0.2 mV/m and that the contours cover a range of 0.2 mV/m to 20 mV/m. Reception in the Sheffield area was the subject of Research Department Report No. K-086, the investigation being undertaken as a result of a large number of complaints about poor signal strength and multipath effects. The results of this investigation can best be summarised by quoting from the conclusions from this report.

"It may be said that where the field strength is less than 0.2 mV/m, ghost images are prevalent and very difficult to eliminate.

When the field strength lies between 0.2 and 0.5 mV/m, echoes are often observed but generally may be reduced or eliminated with a directional receiving aerial. In the range 0.5 to 2 mV/m, where echoes are observed they can be reduced or eliminated by the use of directional aerials.

4% of the population of Sheffield receive a field strength of less than 0.2 mV/m. Their picture quality is very poor as a result of ghost images and interference. No simple measures are likely to improve their reception.

21% of the population have a field strength of from 0.2 to 0.5 mV/m with trouble from echoes, etc., but in many cases an improvement can be effected by the use of a directional receiving aerial.

20% of the population receive 0.5 to 1.0 mV/m and could generally receive a good picture, using a directional aerial when necessary.

55% of the population are provided with field strengths greater than 1 mV/m and are usually free from trouble either from ghost images or from interference".

While the low-lying and heavily screened parts of Sheffield represent the most densely populated areas affected by weak field strength and multipath effects, the same conditions exist in the following localities; Hebden Bridge, Sowerby Bridge, Luddendon and Todmorden. In all these cases it has been found that where multipath effects are severe the receiver is situated on the shadow side of a hill or valley and the neighbouring hills are high and close to the receiver.

5. CONCLUSIONS

The survey of the service area of the Holme Moss transmitter has confirmed the predictions of the field strength in the inner area made as a result of the site tests carried out in 1948. The service in the outer area, i.e. beyond the 1 mV/m contour, is better than that predicted. Troubles due to the multipath interference effects are serious in a few small regions but this trouble can be eliminated or alleviated in all but the worst cases by the use of a directional aerial. The type of aerial best suited to a particular case will depend upon the source and degree of interference.

TABLE I

Town	Field Strength (mV/m 30' a.g.l.)			Town	Field Strength (mV/m 30' a.g.l.)		
	Max.	Mean	Min.		Max.	Mean	Min.
Abergele	1.5	0.9	0.65	Chorley	1.0	0.6	0.2
Accrington	0.55	0.4	0.3	Cleckheaton	36	16	9.0
Altringham	32	16	7.0	Cleethorpes	0.5	0.2	0.16
Ashbourne	0.4	0.2	0.09	Cleveleys	0.95	0.75	0.7
Ashby-de-la-Zouch	0.36	0.25	0.16	Clitheroe	1.1	1.0	0.35
Ashton-under-Lyne	22	15	8.0	Coalville	0.36	0.28	0.2
Atherstone	0.32	0.22	0.12	Coleshill	0.32	0.16	0.09
Audlem	4.0	2.5	1.4	Colne	12	1.4	0.16
				Colwyn	1.8	0.8	0.3
Bacup	2.2	1.6	0.8	Colwyn Bay	1.4	1.0	0.7
Bakewell	1.8	0.6	0.3	Congleton	6.4	2.8	0.8
Bala	0.16	0.1	0.07	Conway	0.62	0.48	0.26
Bangor	0.48	0.28	0.1	Corwen	0.5	0.36	0.24
Barnsley	22	9.0	4.0	Cottingham	3.2	1.3	0.8
Barrow-in-Furness	1.2	0.3	0.12	Crewe	4.5	3.0	2.0
Batley	21	8.0	3.6	Crook	0.16	0.14	0.08
Bawtry	16	4.5	2.8				
Beaumaris	0.44	0.36	0.2	Dalton-in-Furness	0.15	0.1	0.03
Bedale	0.6	0.5	0.44	Darlington	0.6	0.2	0.11
Beverley	0.8	0.5	0.26	Darwen	2.2	0.85	0.27
Billingham	0.4	0.3	0.2	Denbigh	2.4	1.5	0.6
Bingley	6.0	5.0	3.2	Derby	1.5	0.8	0.2
Birkenhead	8.0	3.5	1.4	Dewsbury	26	16	8.8
Blackburn	5.0	1.1	0.12	Doncaster	36	13	3.5
Blackpool	2.2	0.6	0.15	Driffield	1.0	0.6	0.2
Bolton	80	32	6	Easingwold	6.0	3.3	2.8
Boroughbridge	4.0	3.1	2.6	East Retford	1.8	0.85	0.28
Boston	0.28	0.19	0.08	Eccles	28	13	7.0
Bradford	120	12	1.6	Ellesmere	3.4	2.0	0.9
Bridgnorth	0.16	0.1	< 0.04	Farnworth	52	20	12
Brigg	9.0	5.3	3.5	Filey	0.3	0.15	0.04
Brighouse	40	16	6.0	Fleetwood	0.65	0.32	0.2
Burnley	2.4	1.0	0.24	Flint	3.2	2.4	1.0
Burslem	4.0	1.5	0.2	Formby	2.6	2.0	1.8
Bury	25	11	2.5	Frodsham	8.0	4.8	2.0
Buxton	2.8	0.9	0.3				
				Gainsborough	8.0	5.5	4.0
Caernarvon	0.7	0.28	0.06	Glossop	20	8.0	2.4
Carnforth	0.2	0.17	0.14	Goole	1.6	1.1	0.76
Castleford	48	16	5.6	Grangemouth	0.5	0.28	0.14
Chapel-en-le-Frith	1.7	1.2	0.6	Grantham	0.8	0.32	0.22
Cheadle (Staffs)	0.4	0.26	0.18	Grimsby	0.52	0.27	0.14
Chesterfield	1.8	1.1	0.8	Guisborough	0.16	0.1	0.05
Chester	3.6	2.0	0.6	Guiseley	10	7.0	5.6

Town	Field Strength (mV/m 30' a.g.l.)			Town	Field Strength (mV/m 30' a.g.l.)		
	Max.	Mean	Min.		Max.	Mean	Min.
Halifax	185	36	4.0	Mansfield	1.1	0.62	0.18
Hanley	1.0	0.47	0.26	Manchester	85	19	3.5
Harrogate	12	4.0	0.6	Market Drayton	1.4	1.0	0.5
Hartlepool	0.2	0.1	0.08	Market Rasen	2.6	1.6	0.66
Heckmondwike	100	23	12	Market Weighton	8.0	4.0	2.0
Helmsley	0.8	0.35	0.2	Melton Mowbray	0.48	0.18	0.06
Hessle	8.0	3.0	0.8	Menai Bridge	0.8	0.32	0.1
Heysham	0.6	0.45	0.3	Middlesbrough	0.28	0.12	0.08
Holmes Chapel	5.0	3.6	2.5	Middlewich	9.5	6.5	4.0
Holyhead	0.28	0.1	<0.04	Millom	0.5	0.3	0.16
Holywell	5.0	3.2	1.0	Mold	3.4	2.0	0.5
Horncastle	0.17	0.12	0.07	Montgomery	1.0	0.5	0.36
Hornsea	1.0	0.8	0.6	Morecambe	0.8	0.32	0.12
Hoylake	3.2	2.4	1.6				
Huddersfield	320	80	24	Nantwich	4.0	3.0	1.8
Hull	2.6	0.9	0.22	Nelson	0.28	0.26	0.16
Hyde	15	7.1	2.9	Newark	2.0	0.7	0.48
				New Brighton	8.0	4.0	2.8
Ilkley	0.7	0.4	0.3	Newcastle-under-Lyme	0.84	0.44	0.2
				Newport (Salop)	0.7	0.6	0.32
Keighley	12	5.5	2.5	Northallerton	1.6	1.3	0.9
Kendal	0.24	0.14	0.07	Northwich	11	6.4	2.0
Kidderminster	0.14	0.06	<0.04	Nottingham	0.48	0.18	0.05
Knaresborough	5.2	2.8	1.5	Nuneaton	0.16	0.1	0.08
Knottingley	8.0	4.8	3.2				
Knutsford	20	16	10	Oakham	0.1	0.08	0.06
				Oldham	36	10	3.0
Lancaster	0.23	0.1	0.05	Ormskirk	3.5	2.0	0.9
Leeds	60	14	0.8	Oswestry	1.8	1.2	0.8
Leek	1.2	0.48	0.24	Otley	3.5	2.0	0.7
Leigh	12	7.0	6.0	Overton	3.5	2.5	1.2
Leyburn	1.2	0.6	0.38				
Lichfield	0.32	0.22	0.12	Padiham	2.0	0.8	0.35
Lincoln	20	2.0	0.7	Penmaenmawr	0.4	0.25	0.11
Liverpool	11	2.5	0.2	Pickering	1.6	0.8	0.32
Llandudno	1.2	0.6	0.28	Pontefract	32	5.0	2.6
Llanfairfechan	0.14	0.09	0.06	Prescot	6.4	4.0	2.4
Llangollen	1.6	0.8	0.4	Prestatyn	1.5	0.8	0.5
Llanrwst	0.14	0.09	0.06	Prestbury	24	14	6.5
Longton	1.0	0.8	0.5				
Loughborough	0.2	0.17	0.12	Redcar	0.32	0.17	0.1
Louth	0.4	0.22	0.08	Rhos	2.0	1.1	0.45
Lytham	1.1	0.8	0.45	Rhyl	1.4	1.0	0.5
				Richmond	0.5	0.25	0.07
Mablethorpe	0.32	0.24	0.2	Ripon	1.7	0.85	0.06
Macclesfield	16	7.2	1.6	Rochdale	24	10	5.0
Malton	1.8	1.1	0.8	Rotherham	26	10	2.4

Town	Field Strength (mV/m 30' a.g.l.)			Town	Field Strength (mV/m 30' a.g.l.)		
	Max.	Mean	Min.		Max.	Mean	Min.
Ruabon	4.0	3.0	2.3	Stokesley	0.5	0.4	0.27
Rugeley	0.24	0.16	0.1	Stone	0.32	0.2	0.1
Runcorn	20	10	5.6				
Ruthin	2.0	0.72	0.18	Tadcaster	5.0	3.2	1.8
				Tamworth	0.24	0.16	0.1
St. Annes-on-Sea	0.9	0.55	0.26	Tarporley	4.0	3.2	2.4
St. Asaph	1.4	1.0	0.5	Thirsk	1.2	0.9	0.6
St. Helens	4.8	3.2	2.0	Thornaby	0.28	0.21	0.1
Sale	18	12	10	Todmorden	3.0	1.8	0.6
Salford	50	20	9.0	Tunstall	1.4	0.7	0.45
Sandbach	5.2	3.6	2.5	Tydesley	22	10	3.2
Scunthorpe	32	7.0	1.4				
Scarborough	0.9	0.2	0.065	Ulverston	0.8	0.5	0.32
Sedburgh	0.42	0.17	0.12	Utttoxeter	0.64	0.44	0.28
Selby	8.0	6.0	4.0				
Settle	1.3	0.6	0.14	Wakefield	24	14	9.5
Sheffield	26	2.0	0.1	Warrington	10	5.5	2.4
Shipley	7.5	4.0	1.6	Welshpool	0.8	0.2	0.08
Shrewsbury	1.0	0.4	0.1	Wem	1.6	1.2	0.8
Silsden	8.0	5.0	3.5	West Hartlepool	0.2	0.11	0.06
Skegness	0.12	0.08	0.06	West Kirby	6.0	1.4	0.5
Skipton	12	4.5	0.25	Whitchurch	3.0	1.7	0.6
Sleaford	0.32	0.18	0.07	Widnes	7.2	4.8	2.4
Snaith	8.0	6.0	4.0	Wigan	3.5	2.4	1.3
Southport	1.8	0.95	0.32	Winsford	9.6	5.6	1.2
Spalding	0.21	0.11	0.06	Withernsea	0.78	0.52	0.28
Spilsby	0.2	0.18	0.12	Worksop	2.8	1.9	1.4
Stafford	0.3	0.2	0.1	Wrexham	5.5	2.8	1.0
Stalybridge	12	8.5	5.0				
Stockport	11	7.2	3.8	Yarm	0.28	0.16	0.12
Stockton-on-Tees	0.2	0.16	0.11	Yeadon	36	15	7.0
Stoke-on-Trent	0.8	0.36	0.2	York	10	2.4	0.8

TABLE II

MANCHESTER

District	Field Strength (mV/m 30' a.g.l.)		
	Max.	Mean	Min.
Adswold	24	16	10
Benchill	32	28	18
Blackley	28	16	6
Bradford and Beswick	20	14	8
Broughton Park	50	38	16
Central District	14	6	3.5
Cheadle	16	14	12
Cheadle Hulme	26	18	12
Chorlton on Medlock	14	10	5
Collyhurst	25	16	11
Crumpsall and Cheetham	40	24	8
Droylsden	24	20	14
East Didsbury	16	10	6
Failsworth	22	16	12
Levenshulme	18	12	8
Longsight	16	10	7
Lower Kersal	48	28	10
Moss Side	25	16	11
Moston	48	25	11
Newton Heath	30	20	14
Northenden	28	20	15
Old Trafford	24	18	16
Openshaw	22	12	8
Prestwick	85	60	36
Reddish	22	18	10
Rusholme	16	12	10
Stretford	28	20	10
Swinton and Pendlebury	70	36	14
Urmston	32	20	12
Victoria Park	14	12	8
West Didsbury	25	16	11
Whalley Range	17	15	11
Withington	28	16	12
Wythenshawe	32	26	16
Wythenshawe Park	30	22	18

TABLE III

LIVERPOOL

District	Field Strength (mV/m 30' a.g.l.)		
	Max.	Mean	Min.
Aigburth	2.6	1.8	1.0
Anfield	4.0	2.6	2.4
Bootle	4.0	1.8	1.1
Childwall	8.0	4.0	2.4
Fazakerley	4.4	2.5	1.6
Garston	5.2	2.8	1.8
Gateacre and Woolton	11	6.0	3.0
Huyton	4.0	2.6	2.0
Kirkdale	3.0	1.8	0.9
Litherland	4.0	1.5	0.75
Norris Green	4.0	3.0	2.0
North Central	4.0	1.0	0.2
Oakhill Park and Old Swan	4.0	2.5	1.5
St. Michaels	2.4	2.0	1.4
Seaford	1.5	1.1	0.75
South Central	3.0	1.5	0.45
Walton	3.6	2.5	1.8
Wavertree	4.6	3.2	1.9

TABLE IV

LEEDS

Postal District	Approx. District	Field Strength (mV/m 30' a.g.l.)		
		Max.	Mean	Min.
1, 2 and 3	City Centre	5	4	3
4 and 5	Kirkstall	10	4	1.6
6	Headingley	60	25	4
7	Chapel Allerton	40	25	2
8	Sheepscar	40	30	12
9	Roundhay	24	17	3
10 and 11	Osmondthorpe	40	6	2
12	Cross Green	10	5	2
-	Hunslet	30	12	2
-	Upper Wartley	28	18	2
-	Lower Wartley			
-	New Farnley			
-	Bramley			

TABLE V

SHEFFIELD

District	Field Strength (mV/m 30' a.g.l.)		
	Max.	Mean	Min.
Attercliffe	2.0	1.5	0.6
Brightside	25	4.0	0.9
Broomhill	4.5	0.45	0.17
Burngreave	1.0	0.55	0.2
Crookesmoor	1.9	0.55	0.25
Darnall	3.2	2.5	0.18
Ecclesall	2.0	0.5	0.16
Firth Park	6.0	2.0	0.5
Hallam	6.0	2.5	0.18
Handsworth	12	3.0	0.8
Heeley	15	4.0	0.3
Hillsborough	9.5	0.5	0.13
Manor	11	4.5	0.2
Moor	0.6	0.4	0.3
Neepsend	10	2.2	0.4
Nether Edge	1.2	0.55	0.4
Owlerton	0.6	0.35	0.18
Park	14	5.5	0.6
St. Peter's	0.7	0.5	0.4
St. Philip's	0.6	0.45	0.19
Sharrow	0.6	0.45	0.3
Tinsley	2.5	1.7	1.0
Walkley	5.0	1.0	0.3
Woodseats	12	3.5	0.2

TABLE VI

BIRKENHEAD

District	Field Strength (mV/m 30' a.g.l.)		
	Max.	Mean	Min.
Bebington	8.0	5.0	3.0
Central District	3.0	2.2	1.4
Claughton	5.0	3.8	2.6
Dacre Hill	8.0	5.0	3.8
Egremont	4.0	3.5	2.5
Egerton Park	5.0	4.0	3.6
Liscard	4.5	2.6	2.0
Lower Tranmere	4.8	3.8	1.7
New Ferry	5.0	4.0	3.5
Oxton	6.0	4.0	2.5
Port Sunlight	5.5	4.0	3.5
Poulton and Somerville	2.8	2.0	1.5
Prenton	7.0	3.2	1.6
Rock Ferry	4.5	3.0	2.2
Seacombe	2.8	2.3	1.7
Tranmere	8.0	3.2	2.0
Woodley	5.0	3.3	2.0

APPENDIX I

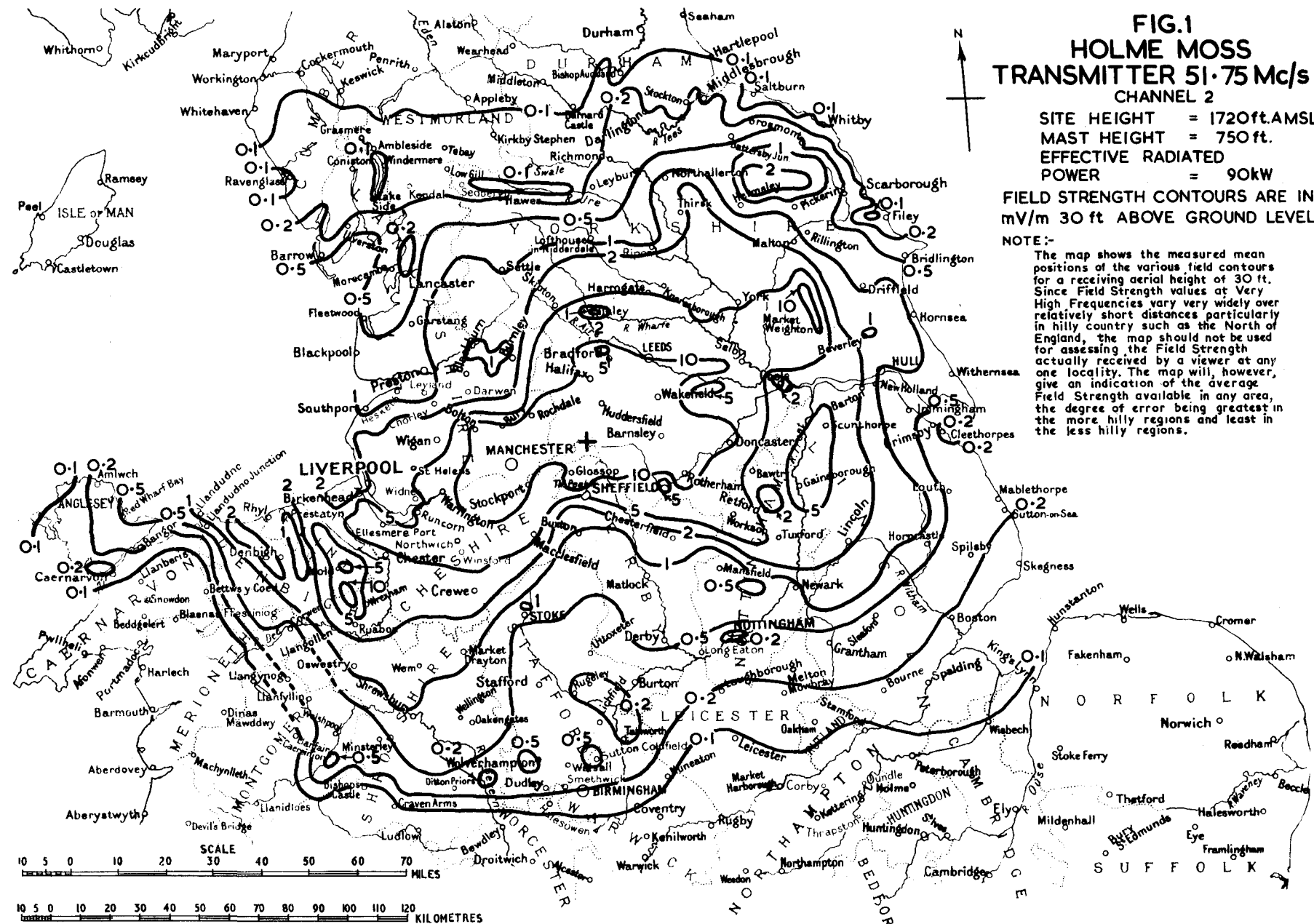
Site Data

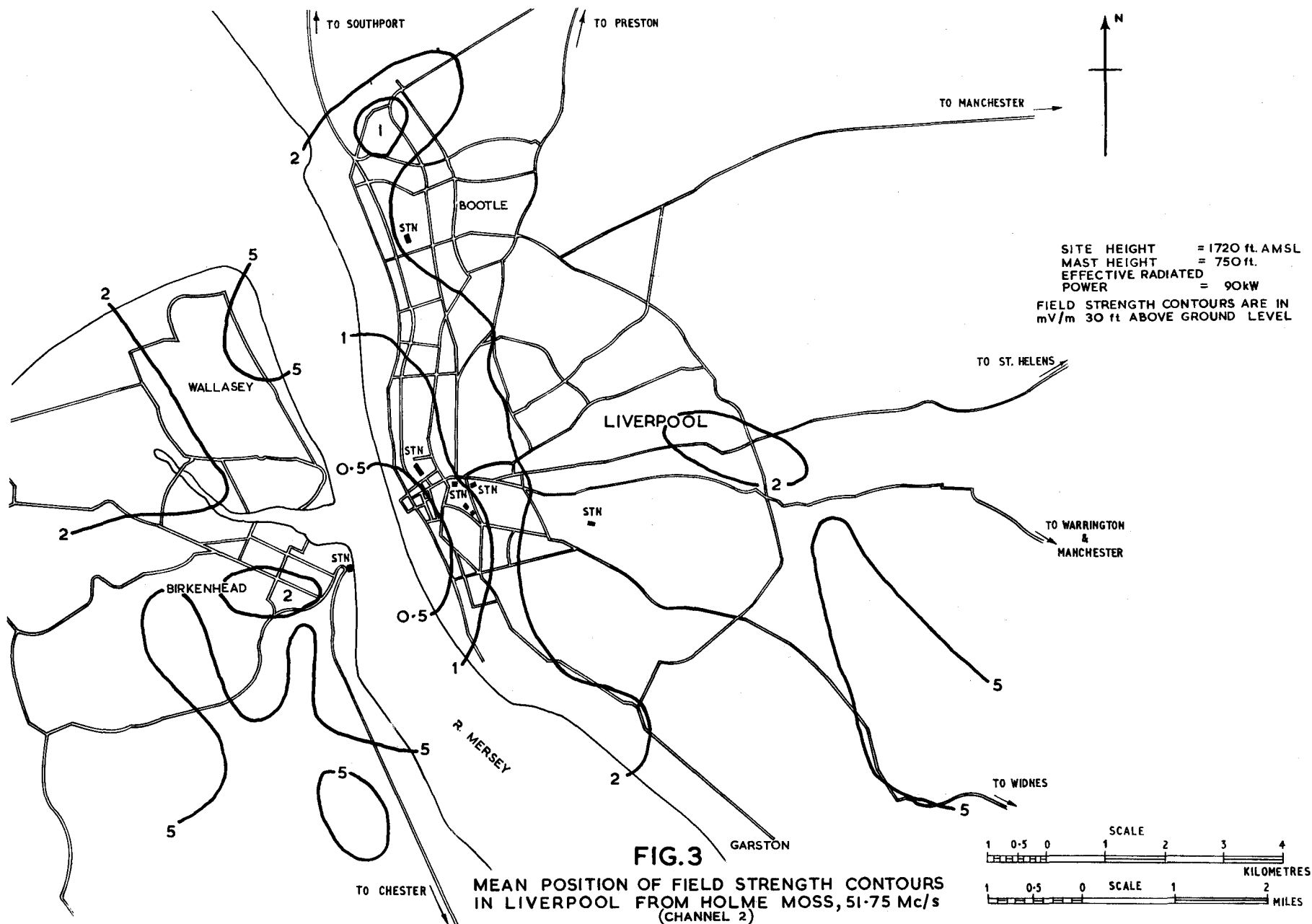
Latitude:	53° 31' 58" N.
Longitude:	01° 51' 22" W.
National grid ref:	SE/095041
Site height above sea level =	1720 ft.
Mast height	= 750 ft.

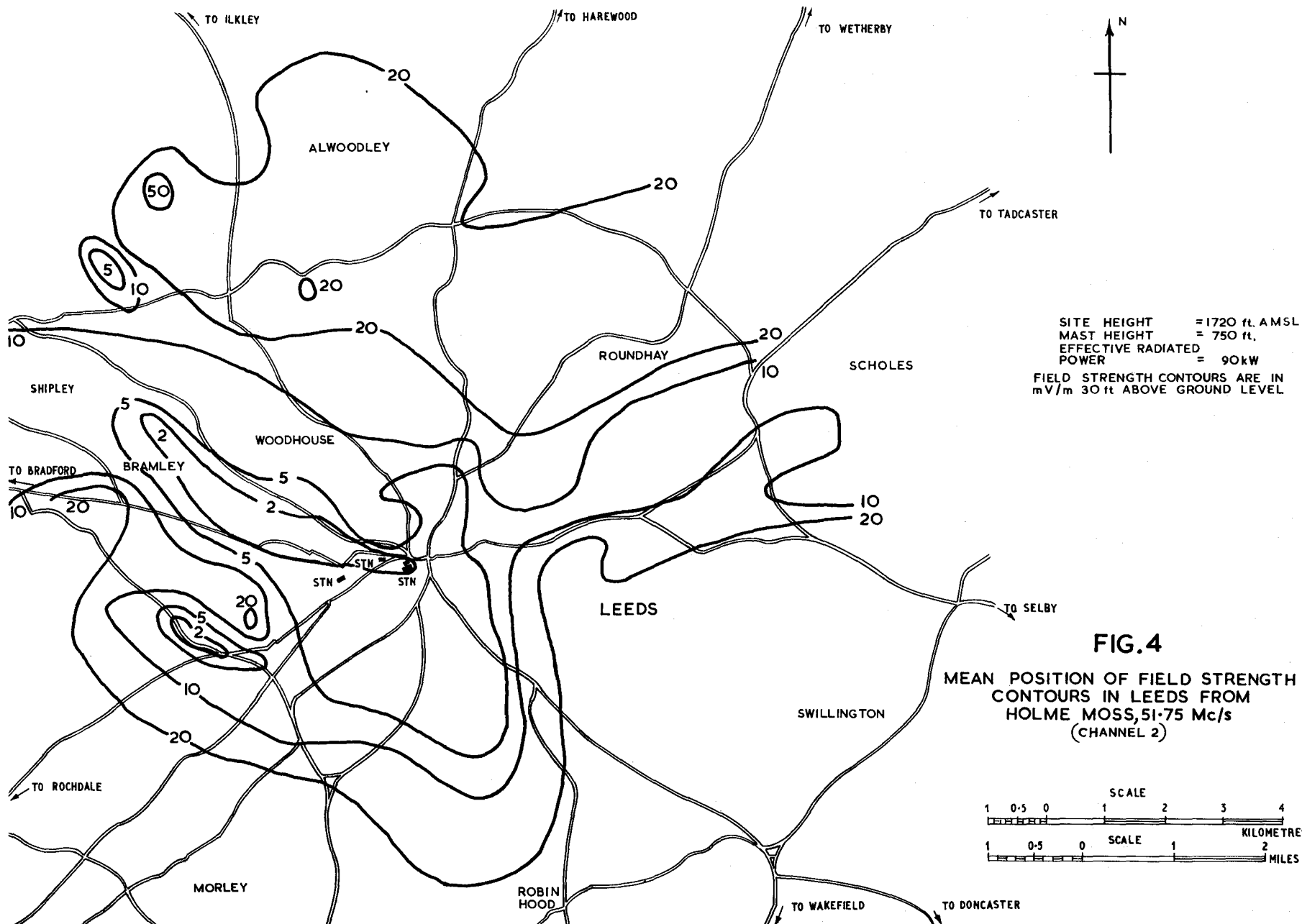
MV

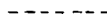
FIELD STRENGTH CONTOURS ARE IN
mV/m 30 ft ABOVE GROUND LEVEL

The map shows the measured mean positions of the various field contours for a receiving aerial height of 30 ft. Since the Field Strength values at Very High Frequencies vary very widely over relatively short distances, particularly in hilly country such as the North of England, the map should not be used for assessing the Field Strength actually received by a viewer at any one locality. The map will, however, give an indication of the average Field Strength available in any area, the degree of error being greatest in the more hilly regions and least in the less hilly regions.







 BOUNDARIES OF AREAS WHERE MULTIPATH INTERFERENCE IS SEVERE & CANNOT BE ELIMINATED BY THE USE OF SIMPLE DIRECTIONAL RECEIVING AERIALS.
 MUNICIPAL BOUNDARIES.



SITE HEIGHT = 1720 ft. AMSL
 MAST HEIGHT = 750 ft.
 EFFECTIVE RADIATED POWER = 90 kW
 FIELD STRENGTH CONTOURS ARE IN mV/m 30 ft ABOVE GROUND LEVEL

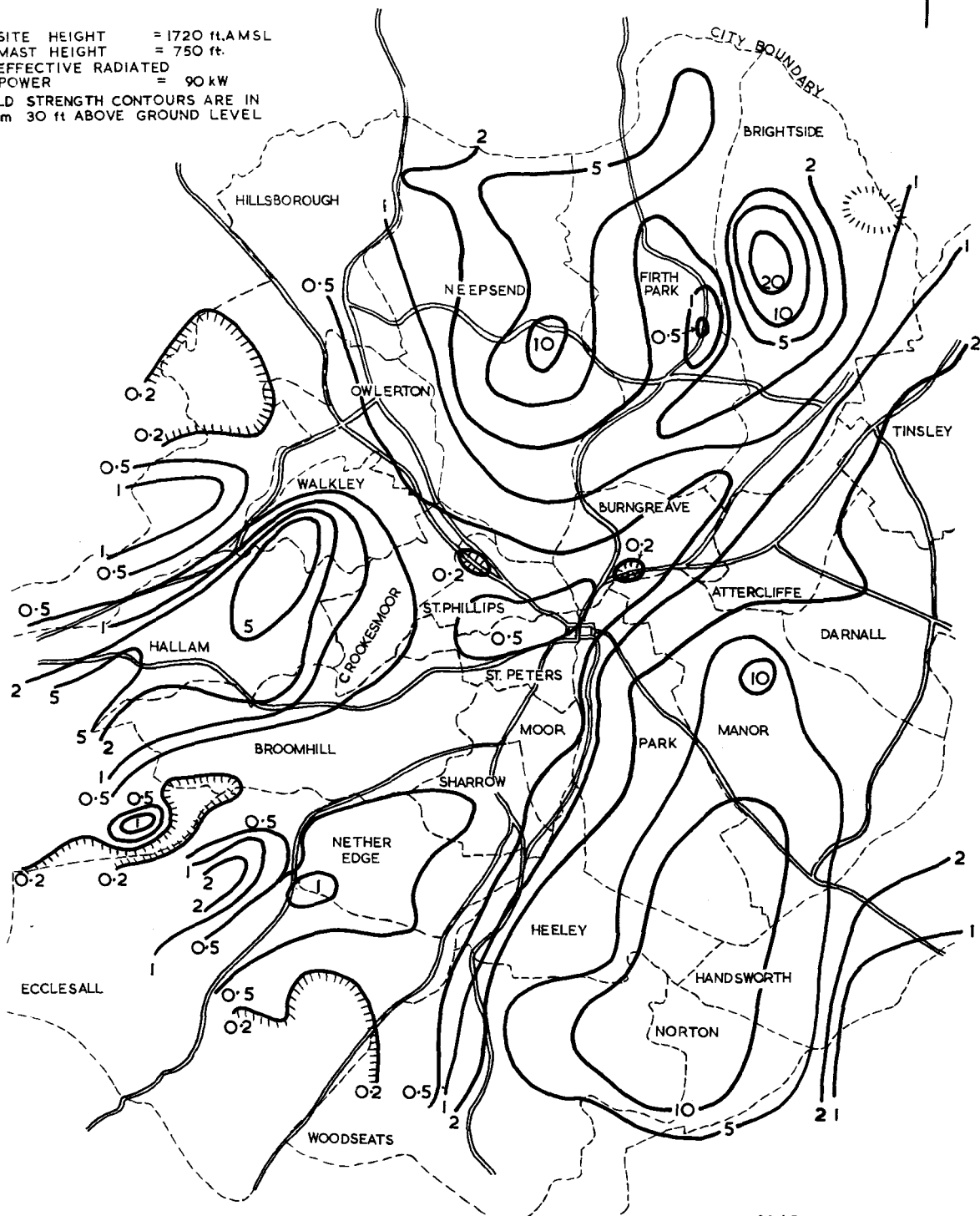


FIG. 5

MEAN POSITION OF FIELD STRENGTH CONTOURS
 IN SHEFFIELD FROM HOLME MOSS, 51.75 Mc/s
 (CHANNEL 2)

